

EXPOSURE TO POLYCYCLIC AROMATIC HYDROCARBONS AFFECTS SPERM QUALITY

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Background and Aims: The objective of this study was to explore whether exposure to polycyclic aromatic hydrocarbons (PAHs) contribute to the alteration of male sperm quality. Our specific aims were to 1) assess sperm quality of coke-oven workers; 2) determine the correlation between PAH biomarkers and sperm DNA integrity; 3) determine sperm oxidative damage by identifying specific DNA lesions; and 4) determine specific gene polymorphisms modifying PAH biotransformation related to sperm DNA integrity.

Methods: A longitudinal study included repeated measurements to account for PAH exposure as it relates to toxic effects on sperms during spermatogenesis. Personal breathing-zone air samples and urine samples were collected to determine PAH external and internal exposure levels, respectively. Semen was collected to assess sperm quality, DNA adducts, and oxidative damage. Blood samples were collected for genotyping. Features of this design include efficient control for confounding factors, accurate exposure ascertainment, and sufficient power to detect exposure related changes in sperm quality.

Results: The high exposed group had a significantly lower percentage of mobile, viable and normal morphological sperms as compared to the control. The concentration of 1-OHP levels negatively correlated with normal sperm morphology, motility and viability. The PAH exposed group experienced higher DNA fragmentation percentages, 8-oxodG concentrations, bulky DNA adducts, and BaP like DNA adducts. GSTM1 null and CYP1A1 MsP1 men had higher sperm DNA fragmentation and 8-oxodG concentration.

Conclusions: Exposure to PAHs decreased sperm quality and increased oxidative DNA damage. Genetic polymorphisms influence the susceptibility of men to sperm DNA damage related to exposure to PAHs. Research results laid a foundation for future study related to the effects of PAHs on reproductive health. Also, the results are useful for reforming best management practices and policies, thus protecting the reproductive health of individuals and/or workers exposed to PAHs.